CLAIMS:

1. A dispersion compensation controlling apparatus comprising:

a first specific frequency component detecting unit detecting a first specific frequency component in a baseband spectrum in a transmission optical signal inputted to a receiving side over a transmission fiber as a transmission line;

a first intensity detecting unit detecting information on an intensity of said first specific frequency component detected by said first specific frequency component detecting unit;

a polarization-mode dispersion controlling unit controlling a polarization-mode dispersion quantity of said transmission line with the intensity of said first specific frequency component detected by said first intensity detecting unit becoming the maximum;

a second specific frequency component detecting unit detecting a second specific frequency component in the baseband spectrum in said transmission optical signal;

a second intensity detecting unit detecting information on the intensity of said second specific frequency component detected by said second specific frequency component detecting unit; and

a chromatic dispersion controlling unit controlling a chromatic dispersion quantity of said transmission line with the intensity of said second specific frequency component detected by said second specific frequency intensity detecting unit becoming the maximum or the minimum.

2. The dispersion compensation controlling apparatus according to claim 1, wherein when said transmission optical signal is an NRZ optical signal, said first specific frequency component detecting unit detects a frequency corresponding to ½ of a bit rate as said first specific frequency component; and

said second specific frequency component detecting unit detects a frequency corresponding to the bit rate as said second specific frequency.

3. The dispersion compensation controlling apparatus according to claim 1, wherein said chromatic dispersion controlling unit sets a chromatic dispersion control quantity in a chromatic dispersion compensator disposed in said transmission line with the intensity of said second specific frequency component detected by said second intensity detecting unit becoming the maximum or the minimum.

4. The dispersion compensation controlling apparatus according to claim 3, wherein said chromatic dispersion controlling unit comprises:

a chromatic dispersion quantity detecting unit detecting a chromatic dispersion quantity of said transmission optical signal from the intensity of said second specific frequency component detected by said second intensity detecting unit by performing an operation with a predetermined second function; and

a chromatic dispersion control quantity setting unit setting a chromatic dispersion control quantity in said chromatic dispersion compensator on the basis of said chromatic dispersion quantity detected by said chromatic dispersion quantity detecting unit in order to compensate chromatic dispersion of said transmission optical signal.

5. The dispersion compensation controlling apparatus according to claim 1, wherein said chromatic dispersion controlling unit feedback-controls a chromatic dispersion compensator disposed in said transmission line with the intensity of said second specific frequency component detected by said second intensity detecting unit becoming the maximum or the minimum.

6. The dispersion compensation controlling apparatus according to claim 1, wherein said second intensity detecting unit can output information on the detected intensity of said second specific frequency component as a monitor signal.

7. A dispersion compensation controlling apparatus comprising:

a first specific frequency component detecting unit detecting a first specific frequency component in a baseband spectrum in a transmission optical signal inputted to a receiving side over a transmission fiber as a transmission line;

a first intensity detecting unit detecting information on an intensity of said first specific frequency component detected by said first specific frequency component detecting unit;

a polarization-mode dispersion controlling unit controlling a polarization-mode dispersion quantity of said transmission line with the intensity of said first specific frequency component detected by said first intensity detecting unit becoming the maximum; and

a chromatic dispersion controlling unit controlling a chromatic dispersion quantity of said transmission line with the intensity of said first specific frequency component detected by said first intensity detecting unit becoming the maximum or the minimum.

8. The dispersion compensation controlling apparatus according to claim 7, wherein when said transmission optical signal is an RZ optical signal or an optical time division multiplex signal, said first specific frequency component detecting unit detects a frequency corresponding to a bit rate or ½ of the bit rate as said first specific frequency component, and when said transmission optical signal is an NRZ optical signal, said first specific frequency component detecting unit detects a frequency corresponding to ½ of the bit rate as said first specific frequency component.

9. The dispersion compensation controlling apparatus according to claim 7, wherein said chromatic dispersion controlling unit sets a chromatic dispersion control quantity in a chromatic dispersion compensator disposed in said transmission line with the intensity of said first specific frequency component detected by said first intensity detecting unit becoming the maximum or the minimum.

10. The dispersion compensation controlling apparatus according to claim 9, wherein said chromatic dispersion controlling unit comprises:

a chromatic dispersion quantity detecting unit detecting a chromatic dispersion quantity of said transmission optical signal from the intensity of said first specific frequency component detected by said first intensity detecting unit by performing an operation with a predetermined second function; and

a chromatic dispersion control quantity setting unit setting a chromatic dispersion control quantity in said chromatic dispersion compensator on the basis of said chromatic dispersion quantity detected by said chromatic dispersion quantity detecting unit in order to compensate chromatic dispersion of said transmission optical signal.

11. The dispersion compensation controlling apparatus according to claim 7, wherein said chromatic dispersion controlling unit feedback-controls a chromatic dispersion compensator disposed in said transmission line with the intensity of said first specific frequency component detected by said first detecting unit becoming the maximum or the minimum.

12. A dispersion compensation controlling apparatus, comprising:

a first specific frequency component detecting unit detecting a first specific frequency component, the specific frequency component corresponding to a bit rate in a baseband spectrum in a transmission optical signal input to a receiving side over a transmission fiber as a transmission line;

a first intensity detecting unit detecting information on an intensity of the first specific frequency component detected by said first specific frequency component detecting unit; and

a polarization-mode dispersion controlling unit controlling a polarization-mode dispersion quantity of the transmission line with the intensity of the first specific frequency component detected by said first intensity detecting unit becoming the maximum,

wherein when the transmission optical signal is an RZ signal or an optical time division multiplex signal, said first specific frequency component detecting unit detects a frequency corresponding to the bit rate as the first specific frequency component,

wherein said polarization-mode dispersion controlling unit sets a polarization-mode dispersion control quantity in a polarization-mode dispersion compensator disposed in the transmission line with the intensity of the first specific frequency component detected by said first intensity detecting unit becoming the maximum, and

wherein said polarization-mode dispersion controlling unit comprises

a polarization-mode dispersion quantity detecting unit detecting a polarization-mode dispersion quantity of the transmission optical signal from the intensity of the first specific frequency component detected by said first intensity detecting unit by using a first function representing an intensity of a frequency component in a baseband spectrum in an optical waveform forming an arbitrary transmission optical signal and in which the frequency information and parameters showing a polarization-mode dispersion quantity are variables, and

a parameter setting unit outputting a parameter setting control signal having parameter information as a control quantity for compensating polarization-mode dispersion of the transmission optical signal on the basis of the polarization-mode dispersion quantity detected by said polarization-mode dispersion quantity detecting unit to the polarization-mode dispersion compensator.

13. The dispersion compensation controlling apparatus according to claim 12, wherein said parameter information is at least either a delay quantity ($\Delta \tau$) between two polarization modes or a splitting ratio (γ) of an optical intensity to said two polarization modes.

14. The dispersion compensation controlling apparatus according to claim 12, wherein said parameter setting unit outputs a parameter setting control signal for setting said parameter information to said polarization-mode dispersion compensator disposed in a receiving terminal apparatus which is a receiving terminal of said transmission optical signal.

15. The dispersion compensation controlling apparatus according to claim 12, wherein said parameter setting unit outputs a parameter setting control signal for setting said parameter information to a polarization-mode dispersion compensator disposed in a transmitting terminal apparatus transmitting said transmission optical signal or a repeating apparatus amplifying and repeating said transmission optical signal.

16. The dispersion compensation controlling apparatus according to claim 12, wherein said parameter setting unit outputs a first parameter setting control signal for setting a splitting ratio (γ) of an optical intensity to two polarization modes to a first polarization-mode dispersion compensator disposed at an arbitrary position in a transmission line and outputs a second parameter setting control signal for setting a delay quantity ($\Delta \tau$) between said two polarization modes to a second polarization-mode dispersion compensator arranged in a rear stage of said first polarization-mode dispersion compensator.

17. The dispersion compensation controlling apparatus according to claim 12 further comprising:

a compensation quantity optimization controlling unit superimposing a predetermined low frequency signal set in advance on the parameter setting control signal outputted from said parameter setting unit and controlling a parameter setting in said parameter setting unit with said low frequency signal component included in the intensity of said first specific frequency component from said first intensity detecting unit becoming zero to optimize a compensation quantity of a polarization-mode dispersion of said transmission optical signal.

18. The dispersion compensation controlling apparatus according to claim 17, wherein said compensation quantity optimization controlling unit superimposes two low frequency signals having low frequency components different from each other as said predetermined low frequency signal on said parameter setting control signal, controls a setting of a splitting ratio (γ) of an optical intensity to two polarization modes in said parameter setting unit such that either one of said two low frequency signal components included in the intensity of said first specific frequency component from said first intensity detecting unit becomes zero, and controls a setting of a delay quantity ($\Delta \tau$) between said two polarization modes in said parameter setting unit such that the other one of said two low frequency signal components included in the intensity of said first specific frequency component from said first intensity detecting unit becomes zero.

19. The dispersion compensation controlling apparatus according to claim 18, wherein said compensation quantity optimization controlling unit switches a setting control on the splitting ratio (γ) of an optical intensity to said two polarization modes and a setting control on the delay quantity ($\Delta\tau$) between two polarization modes with respect to time, and performs said setting controls.

20. The dispersion compensation controlling apparatus according to claim 12 further comprising:

a sweep controlling unit largely sweeping and controlling the parameters showing said polarization-mode dispersion quantity to be given by said polarization-mode dispersion compensator when a system is actuated or the system is re-actuated.

21. A dispersion compensation controlling apparatus, comprising:

a first specific frequency component detecting unit detecting a first specific frequency component, the specific frequency component corresponding to a bit rate in a baseband spectrum in a transmission optical signal input to a receiving side over a transmission fiber as a transmission line;

a first intensity detecting unit detecting information on an intensity of the first specific frequency component detected by said first specific frequency component detecting unit;

a polarization-mode dispersion controlling unit controlling a polarization-mode dispersion quantity of the transmission line with the intensity of the first specific frequency component detected by said first intensity detecting unit becoming the maximum;

a third specific frequency component detecting unit detecting a third specific frequency component in the baseband spectrum in said transmission optical signal; and

a third intensity detecting unit detecting information on an intensity of said third specific frequency component detected by said third specific frequency component detecting unit,

said polarization-mode dispersion controlling unit comprising

a polarization-mode dispersion quantity detecting unit detecting a polarization-mode dispersion quantity of said transmission optical signal from the intensity of said first specific frequency component and the intensity of said third specific frequency component detected by said first intensity detecting unit and said third intensity detecting unit, respectively, by using a first function which is a function representing an intensity of a frequency component in a baseband spectrum in an optical waveform forming an arbitrary transmission optical signal and in which said frequency information and parameters showing a polarization-mode dispersion quantity are variables, and

a parameter setting unit outputting a parameter setting control signal having parameter information as a control quantity for compensating polarization-mode dispersion of said transmission optical signal on the basis of said polarization-mode dispersion quantity detected by said polarization-mode dispersion quantity detecting unit to said polarization-mode dispersion compensator,

wherein when the transmission optical signal is an RZ signal or an optical time division multiplex signal, said first specific frequency component detecting unit detects a frequency corresponding to the bit rate as the first specific frequency component, and

wherein said polarization-mode dispersion controlling unit sets a polarization-mode dispersion control quantity in a polarization-mode dispersion compensator disposed in the transmission line with the intensity of the first specific frequency component detected by said first intensity detecting unit becoming the maximum.

22. A dispersion compensation controlling apparatus, comprising:

a first specific frequency component detecting unit detecting a first specific frequency component, the specific frequency component corresponding to a bit rate in a baseband spectrum in a transmission optical signal input to a receiving side over a transmission fiber as a transmission line;

a first intensity detecting unit detecting information on an intensity of the first specific frequency component detected by said first specific frequency component detecting unit; and

a polarization-mode dispersion controlling unit controlling a polarization-mode dispersion quantity of the transmission line with the intensity of the first specific frequency component detected by said first intensity detecting unit becoming the maximum,

wherein when the transmission optical signal is an RZ signal or an optical time division multiplex signal, said first specific frequency component detecting unit detects a frequency corresponding to the bit rate as the first specific frequency component,

wherein said polarization-mode dispersion controlling unit feedback-controls at least either a polarization controller or an inter-polarization-mode delay unit disposed in said transmission line path with the intensity of said first specific frequency component detected by said first intensity detecting unit becoming the maximum, and

wherein said inter-polarization-mode delay unit is configured as a device splitting polarization-mode components by a polarization beam splitter, giving a delay difference between said polarization-mode component by a variable optical delay path and multiplexing said polarization mode components.

23. A dispersion compensation controlling apparatus, comprising:

a first specific frequency component detecting unit detecting a first specific frequency component, the specific frequency component corresponding to a bit rate in a baseband spectrum in a transmission optical signal input to a receiving side over a transmission fiber as a transmission line;

a first intensity detecting unit detecting information on an intensity of the first specific frequency component detected by said first specific frequency component detecting unit; and

a polarization-mode dispersion controlling unit controlling a polarization-mode dispersion quantity of the transmission line with the intensity of the first specific frequency component detected by said first intensity detecting unit becoming the maximum,

wherein when the transmission optical signal is an RZ signal or an optical time division multiplex signal, said first specific frequency component detecting unit detects a frequency corresponding to the bit rate as the first specific frequency component,

wherein said polarization-mode dispersion controlling unit feedback-controls at least either a polarization controller or an inter-polarization-mode delay unit disposed in said transmission line path with the intensity of said first specific frequency component detected by said first intensity detecting unit becoming the maximum, and

wherein said inter-polarization-mode delay unit is configured as a device in which a plurality of polarization maintaining fibers having different polarization dispersion values are arranged in parallel and said polarization maintaining fibers transmitting an optical signal are switched by an optical switch according to a polarization-mode dispersion quantity of said transmission line.

24. A dispersion compensation controlling apparatus, comprising:

a first specific frequency component detecting unit detecting a first specific frequency component, the specific frequency component corresponding to a bit rate in a baseband spectrum in a transmission optical signal input to a receiving side over a transmission fiber as a transmission line;

a first intensity detecting unit detecting information on an intensity of the first specific frequency component detected by said first specific frequency component detecting unit; and

a polarization-mode dispersion controlling unit controlling a polarization-mode dispersion quantity of the transmission line with the intensity of the first specific frequency component detected by said first intensity detecting unit becoming the maximum,

wherein when the transmission optical signal is an RZ signal or an optical time division multiplex signal, said first specific frequency component detecting unit detects a frequency corresponding to the bit rate as the first specific frequency component,

wherein said polarization-mode dispersion controlling unit feedback-controls at least either a polarization controller or an inter-polarization-mode delay unit disposed in said transmission line path with the intensity of said first specific frequency component detected by said first intensity detecting unit becoming the maximum, and

wherein said polarization-mode dispersion controlling unit performs a control in a first control mode in which any one of an azimuth angel of a ¼ wave plate, an azimuth angle of a ½ wave plate in said polarization controller and a delay quantity between polarization modes of said inter-polarization-mode delay unit is changed with the intensity of said first specific frequency component becoming the maximum while the remaining control parameters among said azimuth angles and said delay quantity between polarization modes are fixed, after said first control mode, performs a control in a second control mode in which one of said remaining control parameters is changed with the intensity of said first specific frequency component becoming the maximum while the control parameter having been first changed and the other one of the remaining control parameters are fixed, finally performs a control in a third control mode in which the other one of said remaining control parameters is changed with the intensity of said first specific frequency component becoming the maximum while the control parameter having been first changed and the one of said remaining control parameters are fixed.

25. A dispersion compensation controlling apparatus, comprising:

a first specific frequency component detecting unit detecting a first specific frequency component, the specific frequency component corresponding to a bit rate in a baseband spectrum in a transmission optical signal input to a receiving side over a transmission fiber as a transmission line;

a first intensity detecting unit detecting information on an intensity of the first specific frequency component detected by said first specific frequency component detecting unit; and

a polarization-mode dispersion controlling unit controlling a polarization-mode dispersion quantity of the transmission line with the intensity of the first specific frequency component detected by said first intensity detecting unit becoming the maximum,

wherein when the transmission optical signal is an RZ signal or an optical time division multiplex signal, said first specific frequency component detecting unit detects a frequency corresponding to the bit rate as the first specific frequency component,

wherein said polarization-mode dispersion controlling unit feedback-controls at least either a polarization controller or an inter-polarization-mode delay unit disposed in said transmission line path with the intensity of said first specific frequency component detected by said first intensity detecting unit becoming the maximum, and

wherein said polarization-mode dispersion controlling unit performs a control in a fourth control mode in which any one of an azimuth angle of a ¼ wave plate, an azimuth angle of a ½ wave plate in said polarization controller and a delay quantity between polarization modes of said inter-polarization-mode delay unit is changed with the intensity of said first specific frequency component increasing while the remaining control parameters among said azimuth angles and said delay quantity between polarization modes are fixed, after said fourth control mode, performs a control in a fifth control mode in which one of the remaining parameters is changed with the intensity of said first specific frequency component increasing while the control parameter having been first changed and the other one of the remaining control parameters are fixed, finally performs a control in a sixth control mode in which the other one of said remaining control parameters is changed with the intensity of said first specific frequency component increasing while the control parameter having been first changed and the one of said remaining control parameters are fixed, after that, repeatedly executes said fourth control mode, said fifth control mode and said sixth control mode until the intensity of said first specific frequency component becomes the maximum.

26. A dispersion compensation controlling apparatus, comprising:

a first specific frequency component detecting unit detecting a first specific frequency component, the specific frequency component corresponding to a bit rate in a baseband spectrum in a transmission optical signal input to a receiving side over a transmission fiber as a transmission line;

a first intensity detecting unit detecting information on an intensity of the first specific frequency component detected by said first specific frequency component detecting unit;

a polarization-mode dispersion controlling unit controlling a polarization-mode dispersion quantity of the transmission line with the intensity of the first specific frequency component detected by said first intensity detecting unit becoming the maximum; and

a compensation quantity optimization controlling unit for superimposing a predetermined low frequency signal set in advance on control signals to be outputted from said polarization-mode dispersion controlling unit to said polarization controller and said inter-polarization-mode delay unit, and controlling said polarization controller and said inter-polarization-mode delay unit with said low frequency signal component included in the intensity of said first specific frequency component from said first intensity detecting unit becoming zero to optimize a compensation quantity of polarization-mode dispersion of said transmission optical signal,

wherein when the transmission optical signal is an RZ signal or an optical time division multiplex signal, said first specific frequency component detecting unit detects a frequency corresponding to the bit rate as the first specific frequency component, and

wherein said polarization-mode dispersion controlling unit feedback-controls at least either a polarization controller or an inter-polarization-mode delay unit disposed in said transmission line path with the intensity of said first specific frequency component detected by said first intensity detecting unit becoming the maximum.

27. The dispersion compensation controlling apparatus according to claim 26, wherein said compensation quantity optimization controlling unit low-frequency-modulates an azimuth angle of a ¼ wave plate, an azimuth angle of a ½ wave plate in said polarization controller and a delay quantity between polarization modes of said inter-polarization-mode delay unit with different frequencies, detects said first frequency component intensity in the baseband spectrum of said transmission optical signal, and optimizes the azimuth angle of said ¼ wave plate, the azimuth angle of said ½ wave plate in said polarization controller and the delay quantity between polarization modes of said inter-polarization-mode delay unit with an intensity modulation component of a low frequency component included therein becoming zero.

28. A dispersion compensation controlling apparatus, comprising:

a first specific frequency component detecting unit detecting a first specific frequency component, the specific frequency component corresponding to a bit rate in a baseband spectrum in a transmission optical signal input to a receiving side over a transmission fiber as a transmission line;

a first intensity detecting unit detecting information on an intensity of the first specific frequency component detected by said first specific frequency component detecting unit; and

a polarization-mode dispersion controlling unit controlling a polarization-mode dispersion quantity of the transmission line with the intensity of the first specific frequency component detected by said first intensity detecting unit becoming the maximum,

wherein when the transmission optical signal is an RZ signal or an optical time division multiplex signal, said first specific frequency component detecting unit detects a frequency corresponding to the bit rate as the first specific frequency component,

wherein said polarization-mode dispersion controlling unit feedback-controls at least either a polarization controller or an inter-polarization-mode delay unit disposed in said transmission line path with the intensity of said first specific frequency component detected by said first intensity detecting unit becoming the maximum, and

wherein said polarization-mode dispersion controlling unit controls only said polarization controller during system operation, and controls said inter-polarization-mode delay unit at the time of start of system operation or when an element determining conditions of polarization-mode dispersion in said transmission line is switched.

29. A dispersion compensation controlling apparatus, comprising:

a first specific frequency component detecting unit detecting a first specific frequency component, the specific frequency component corresponding to a bit rate in a baseband spectrum in a transmission optical signal input to a receiving side over a transmission fiber as a transmission line;

a first intensity detecting unit detecting information on an intensity of the first specific frequency component detected by said first specific frequency component detecting unit; and

a polarization-mode dispersion controlling unit controlling a polarization-mode dispersion quantity of the transmission line with the intensity of the first specific frequency component detected by said first intensity detecting unit becoming the maximum,

wherein when the transmission optical signal is an RZ signal or an optical time division multiplex signal, said first specific frequency component detecting unit detects a frequency corresponding to the bit rate as the first specific frequency component,

wherein said polarization-mode dispersion controlling unit feedback-controls at least either a polarization controller or an inter-polarization-mode delay unit disposed in said transmission line path with the intensity of said first specific frequency component detected by said first intensity detecting unit becoming the maximum, and

wherein said polarization-mode dispersion controlling unit comprises a maximum allowable polarization-mode dispersion quantity setting means for setting a maximum allowable polarization-mode dispersion quantity, sets a delay quantity of said inter-polarization-mode delay unit to a value above a lower limit value defined as a value obtained by subtracting said maximum allowable polarization-mode dispersion quantity from one time slot and below an upper limit value defined as a value having a magnitude twice said maximum allowable polarization-mode dispersion quantity during system operation when feedback-controlling at least either said polarization controller or said inter-polarization-mode delay unit disposed in said transmission line with an intensity of a frequency component corresponding to ½ of a bit rate as said first specific frequency component detected by said first intensity detecting unit becoming the maximum.

30. The dispersion compensation controlling apparatus according to claim 29, wherein said polarization-mode dispersion controlling unit sets a delay quantity of said inter-polarization-mode delay unit at the time of system operation to said lower limit value.

31. The dispersion compensation controlling apparatus according to claim 29, wherein said polarization-mode dispersion controlling unit sets a delay quantity of said inter-polarization-mode delay unit at the time of system operation to said upper limit value.

32. A dispersion compensation controlling apparatus, comprising:

a first specific frequency component detecting unit detecting a first specific frequency component, the specific frequency component corresponding to a bit rate in a baseband spectrum in a transmission optical signal input to a receiving side over a transmission fiber as a transmission line;

a first intensity detecting unit detecting information on an intensity of the first specific frequency component detected by said first specific frequency component detecting unit; and

a polarization-mode dispersion controlling unit controlling a polarization-mode dispersion quantity of the transmission line with the intensity of the first specific frequency component detected by said first intensity detecting unit becoming the maximum,

wherein when the transmission optical signal is an RZ signal or an optical time division multiplex signal, said first specific frequency component detecting unit detects a frequency corresponding to the bit rate as the first specific frequency component,

wherein said polarization-mode dispersion controlling unit feedback-controls at least either a polarization controller or an inter-polarization-mode delay unit disposed in said transmission line path with the intensity of said first specific frequency component detected by said first intensity detecting unit becoming the maximum, and

wherein said inter-polarization-mode delay unit is configured with a polarization maintaining fiber.

33. A dispersion compensation controlling apparatus, comprising:

a first specific frequency component detecting unit detecting a first specific frequency component, the specific frequency component corresponding to a bit rate in a baseband spectrum in a transmission optical signal input to a receiving side over a transmission fiber as a transmission line;

a first intensity detecting unit detecting information on an intensity of the first specific frequency component detected by said first specific frequency component detecting unit; and

a polarization-mode dispersion controlling unit controlling a polarization-mode dispersion quantity of the transmission line with the intensity of the first specific frequency component detected by said first intensity detecting unit becoming the maximum,

wherein when the transmission optical signal is an RZ signal or an optical time division multiplex signal, said first specific frequency component detecting unit detects a frequency corresponding to the bit rate as the first specific frequency component,

wherein said polarization-mode dispersion controlling unit feedback-controls at least either a polarization controller or an inter-polarization-mode delay unit disposed in said transmission line path with the intensity of said first specific frequency component detected by said first intensity detecting unit becoming the maximum, and

wherein said inter-polarization-mode delay unit is configured with an inter-polarization-mode variable delay unit in a state where a delay quantity is fixed.

34. A dispersion compensation controlling apparatus, comprising:

a first specific frequency component detecting unit detecting a first specific frequency component, the specific frequency component corresponding to a bit rate in a baseband spectrum in a transmission optical signal input to a receiving side over a transmission fiber as a transmission line;

a first intensity detecting unit detecting information on an intensity of the first specific frequency component detected by said first specific frequency component detecting unit;

a polarization-mode dispersion controlling unit controlling a polarization-mode dispersion quantity of the transmission line with the intensity of the first specific frequency component detected by said first intensity detecting unit becoming the maximum; and

a timing extracting unit extracting a timing of a received signal on the basis of the first specific frequency component detected by said first specific frequency component detecting unit,

wherein when the transmission optical signal is an RZ signal or an optical time division, multiplex signal, said first specific frequency component detecting unit detects a frequency corresponding to the bit rate as the first specific frequency component.

35. A dispersion compensation controlling method comprising the steps of:

a first specific frequency component detecting step of detecting a first specific frequency component in a baseband spectrum in a transmission optical signal inputted to a receiving side over a transmission fiber as a transmission line;

a first intensity detecting step of detecting information on an intensity of said first specific frequency component detected at said first specific frequency component detecting step;

a polarization-mode dispersion controlling step of controlling a polarization-mode dispersion quantity of said transmission line with the intensity of said first specific frequency component detected at said first intensity detecting step becoming the maximum;

a second specific frequency component detecting step of detecting a second specific frequency component in the baseband spectrum in said transmission optical signal;

a second intensity detecting step of detecting information on an intensity of said second specific frequency component detected at said second specific frequency component detecting step; and

a chromatic dispersion controlling step of controlling a chromatic dispersion quantity of said transmission line with the intensity of said second specific frequency component detected at said second intensity detecting step becoming the maximum or the minimum.

36. A dispersion compensation controlling method comprising the steps of:

a first specific frequency component detecting step of detecting a first specific frequency component in a baseband spectrum in a transmission optical signal inputted to a receiving side over a transmission fiber as a transmission line;

a first intensity detecting step of detecting information on an intensity of said first specific frequency component detected at said first specific frequency component detecting step;

a polarization-mode dispersion controlling step of controlling a polarization-mode dispersion quantity of said transmission line with the intensity of said first specific frequency component detected at said first intensity detecting step becoming the maximum; and

a chromatic dispersion controlling step of controlling a chromatic dispersion quantity of said transmission line with the intensity of said first specific frequency component detected at said first intensity detecting step becoming the maximum or the minimum.

37. The dispersion compensation controlling method according to claim 36, wherein said polarization-mode dispersion controlling step and said chromatic dispersion controlling step are independently executed.

38. The dispersion compensation controlling method according to claim 36, wherein said polarization-mode dispersion controlling step and said chromatic dispersion controlling step are executed in time series.